

WIRELESS HEARTBEAT-DETECTING DEVICE WITH ELECTRO-MAGNETIC INTERFERENCE SHIELDING DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a wireless heartbeat-detecting device, and more particularly to a wireless heartbeat-detecting device with an electro-magnetic interference shielding device.

[0003] 2. Description of the Prior Art

[0004] There are various types of exercisers developed for people who live busily in the modern commercial society and require appropriate exercises. And, for a person to accurately control an appropriate quantity of exercise and to monitor personal physical condition, various types of body signal detecting devices have also been researched and developed.

[0005] For example, **Fig. 1** shows a currently available heartbeat-detecting device that is used to detect a heartbeat or pulse signal from a user **100**. This type of heartbeat-detecting device is generally divided into two types, namely, wired and wireless types. Since the wireless type heartbeat-detecting device has the advantages of easy for use and free from limitation by a signal transmitting line, it has been widely used in various places.

[0006] A wireless heartbeat-detecting device mainly includes a heartbeat detecting and transmitting unit or detector **101** for fitting on the user's chest, and a receiving and displaying unit or receiver **102** for fitting around the user's wrist. A heartbeat signal detected by the heartbeat detecting and transmitting unit **101** is transmitted via a carrier frequency and then received and displayed by the wrist-type receiving and displaying unit **102**.

[0007] The heartbeat detecting and transmitting unit **101** of the wireless heartbeat-detecting device basically includes a conductive rubber pad serving as an electrode to detect a heartbeat signal, and a circuit board for processing and transmitting signals. When the conductive rubber pad and the circuit board are electrically connected, an actual heartbeat signal detected by the conductive rubber pad may be wirelessly transmitted via a signal transmitter of the circuit board.

[0008] **Fig. 2** shows a transmitting antenna **103** for the conventional wireless heartbeat-detecting device that is not shielded with any means. In this condition, a heartbeat pulse signal in a form of electro-magnetic wave transmitted out at both ends of the transmitting antenna **103**. In a most ideal condition, only a nearby corresponding receiver is able to receive the heartbeat pulse signal transmitted from the signal transmitter of the wireless heartbeat-detecting device. However, in the use of such wireless heartbeat-detecting device, the problem of signal interference always happens. For example, when the conventional wireless heartbeat-detecting device is used in some places, such as in a health club, a gymnasium, or a rehabilitation center, it is frequently interfered by various signals from other wireless heartbeat-detecting devices because the distances among the users are too close. Thus, it is likely that the heartbeat signal is not received probably and data about the heartbeat signal is incorrectly determined.

[0009] A practice commonly and conventionally adopted to prevent the signal interference among neighboring wireless heartbeat-detecting devices is to include a signal encoding and decoding circuit in the transmitter and the receiver of the heartbeat-detecting devices. There are also other products that solve the problem of signal interference by way of using different radio channels to send the wireless heartbeat signals. However, this design does not effectively solve the problem of signal interference in the actual use thereof.

[0010] Therefore, it is necessary to take additional measures to effectively overcome the problem of signal interference to meet user's actual need.

SUMMARY OF THE INVENTION

[0011] A primary object of the present invention is to provide an interference shielding structure for a wireless heartbeat-detecting device, so that even though a plurality of wireless heartbeat-detecting devices are used at close distances, interference among the wireless heartbeat-detecting devices is avoided.

[0012] Another object of the present invention is to provide a wireless heartbeat-detecting device with an electro-magnetic interference shielding device. The electro-magnetic interference shielding device is simple in structure and enables neighboring persons to use the wireless heartbeat-detecting devices without signal interference.

[0013] To achieve the above and other objects, the wireless heartbeat-detecting device according to an embodiment of the present invention includes a shielding member which is positioned above a transmitting antenna by a predetermined distance by fastening two downward extended locating legs at the two corresponding ends of the shielding member on a circuit board of the wireless heartbeat-detecting device, so that a heartbeat signal transmitted from the transmitting antenna is shielded by the electro-magnetic interference shielding member and is sent to a nearby corresponding receiver via only limited signal transmitting paths. Therefore, when multiple sets of such wireless heartbeat-detecting devices are used at neighboring region, signals transmitted from the devices would not interfere with one another.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

[0015] **Fig. 1** schematically shows a conventional wireless heartbeat-detecting

device fitted on a user's body;

[0016] **Fig. 2** schematically shows a transmitting antenna of the conventional wireless heartbeat-detecting device with no shielding, in which a heartbeat pulse signal in a form of electro-magnetic wave transmitted out at both ends of the antenna;

[0017] **Fig. 3** is a partially exploded perspective view of a wireless heartbeat-detecting device with electro-magnetic interference shielding device according to a first embodiment of the present invention;

[0018] **Fig. 4** is a fully exploded perspective view of the wireless heartbeat-detecting device with electro-magnetic interference shielding device of **Fig. 3**;

[0019] **Fig. 5** is a sectional view taken along line s of **Fig. 3**;

[0020] **Fig. 6** is a schematic view showing a transmitting antenna of the wireless heartbeat-detecting device with electro-magnetic interference shielding device, in which the transmitting antenna is shielded by a shielding member of the present invention and a heartbeat signal in the form electro-magnetic wave transmitted at two ends of the transmitting antenna is attenuated;

[0021] **Fig. 7** schematically shows that a plurality of signals transmitted from a multiple sets of the wireless heartbeat-detecting device with electro-magnetic interference shielding device of the present invention at close distances do not interfere with one another;

[0022] **Fig. 8** is a perspective view of a shielding member according to a second embodiment of the present invention; and

[0023] **Fig. 9** is a perspective view of a shielding member according to a third embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0024] Please refer to **Figs. 3** and **4** that are partially and fully exploded perspective views, respectively, of a wireless heartbeat-detecting device with an electro-magnetic interference (EMI) shielding device according to a first preferred embodiment of the present invention. For the purpose of clarity, the present invention is referred to as the wireless heartbeat-detecting device and generally denoted by reference number **1**. As shown, the wireless heartbeat-detecting device **1** mainly includes a belt-associated seat **10** defining an internal space **11**. Two conductive sections **12** are separately provided at two lateral ends of the internal space **11**, and two belts **13** are separately extended from an outer side of the two conductive sections **12**. The two belts **13** may be tied to a user's trunk to locate the wireless heartbeat-detecting device **1** at the user's chest.

[0025] A circuit board **2** is mounted in the internal space **11** of the belt-associated seat **10**. A conventional control circuit is provided on the circuit board **2** and includes a transmitting antenna **3** that is disposed on the circuit board **2** and connected to a wireless signal transmitting circuit of the control circuit of the wireless heartbeat-detecting device **1**, so that a heartbeat signal detected by the wireless heartbeat-detecting device **1** may be transmitted via the wireless signal transmitting circuit.

[0026] In the embodiment, the circuit board **2** also includes a shielding member **4** which is mounted at a predetermined distance above the transmitting antenna **3**, as can be clearly seen from **Fig. 5**. With the shielding member **4**, the heartbeat signal transmitted via the transmitting antenna **3** is shielded at certain directions and areas and therefore can only be transmitted along restricted transmitting paths to a nearby corresponding receiver. **Fig. 6** shows that when the transmitting antenna **3** is housed in the shielding member **4**, the transmitted heartbeat signal in the form of electro-magnetic wave at two lateral ends of the transmitting antenna **3** is attenuated.

[0027] The shielding member **4** is a substantially flat plate having two

downward extended wing portions 42 provided at two lateral ends thereof. A plurality of locating legs 41 are extended from the shielding member 4 toward the circuit board 2. By engaging the locating legs 41 to the circuit board 2, the shielding member 4 is positioned above the transmitting antenna 3 by a predetermined distance. Moreover, the locating legs 41 of the shielding member 4 are connected to a grounding conductor of the circuit board 2.

[0028] A cover 14 is provided at a top of the belt-associated seat 10 which comprises a battery compartment 15 for holding a battery 16 therein. The battery compartment 15 is then openably closed with a lid 17.

[0029] **Fig. 7** shows that a multiple sets of wireless heartbeat-detecting devices 1 of the present invention are used by closely located users at the same time. Signals from transmitters TX1, TX2, and TX3 of these multiple sets of wireless heartbeat-detecting devices 1 are shielded by respective shielding members 4 and is only capable to transmit to corresponding receivers RX1, RX2, and RX3 of the multiple sets of wireless heartbeat-detecting devices 1. In other words, receivers RX1, RX2, and RX3 are not able to receive signals from any nearby transmitters except the sole corresponding transmitter. Thereby mutual interference is avoided.

[0030] **Fig. 8** shows a shielding member 4a according to a second embodiment of the present invention. As shown, the shielding member 4a includes two wing portions 43 formed at two opposite longitudinal sides thereof. With the wing portions 43 having an extended length, transmitted directions and areas of signals transmitted via the transmitting antenna 3 may be further limited.

[0031] **Fig. 9** shows a shielding member 4b according to a third embodiment of the present invention. As shown, the shielding member 4b is a substantially flat plate having two wing portions 44 formed at two lateral ends thereof. The wing portions 44 are fastened to the circuit board 2 and completely shield the heartbeat signal transmitting at two lateral ends of the transmitting antenna 3.

[0032] From the preferred embodiments, it is apparent that shielding device of the present invention effectively shields the signal of a wireless heartbeat-detecting device and prevents interfering nearby wireless heartbeat-detecting devices.

[0033] The present invention has been described with some preferred embodiments thereof and it is understood that many changes and modifications in the described embodiments can be carried out without departing from the scope and the spirit of the invention that is intended to be limited only by the appended claims.